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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,295	12/04/2003	Mohamed Y. Soliman	2003-IP-011150U1	7913
71/407	7590	03/03/2011		
ROBERT A. KENT P.O. BOX 1431 DUNCAN, OK 73536			EXAMINER GEDRESILASSIE, KIBROM K	
			ART UNIT	PAPER NUMBER
			2128	
			NOTIFICATION DATE	DELIVERY MODE
			03/03/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/728,295

Applicant(s)

SOLIMAN ET AL

Examiner

KIBROM GEBRESILASSIE

Art Unit

2128

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-912)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. Continued Examination under 37 CFR 1.114 after Final Rejection A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/03/2010 has been entered.
2. Claims 1-31 are presented for examination.

Response to Arguments

3. Applicant's amendments with respect to claims 1, 18, and 24 have been considered but are moot in view of the new ground(s) of rejection.
4. Response to Remarks/Argument filed on 02/07/2011:

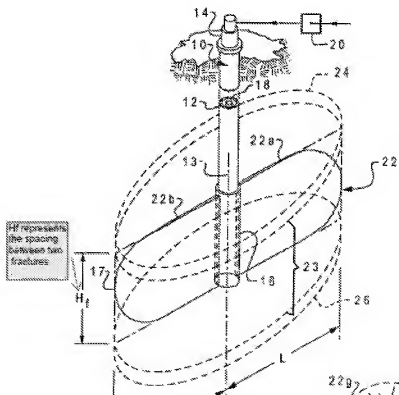
Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. Further, they do not show how the amendments avoid such references or objections.

5. Response to Remarks/Arguments filed on 10/12/2010:

"In particular, with respect to independent claims 1, 18, and 24, Perkins fails to disclose "generating an optimized number, spacing and size for two or more fractures in a subterranean formation." The spacing of two fractures is illustrated, for example, in Figure 2 of the instant application. Dimension "D" represents the spacing between fracture 202 and fracture 204. Depending on the particular orientation of the well, spacing between fractures may correlate to differences in true vertical depth and/or measured depth from one fracture to the next. See, instant application at para. [0065] and Figures 15-16. Perkins does not describe spacing of fractures. Rather, it describes the direction in which various fracture wings of a given fracture will propagate." (Remarks, pg. 8, paragraph four).

Examiner respectfully disagrees. The spacing of two fractures is clearly illustrated in the figure below. The "hf" represents the spacing between two fractures and therefore disclosed.



Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- Claims 1, 18, and 24 are recited "selecting a method to model each fracture", but it is not specific what "method" is referring to and therefore it is vague and indefinite.
- As per claim 25, there is no antecedent basis for limitation "the optimizing step".

Specification

8. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: The specification fails to provide antecedent basis for "medium" limitation. Without antecedent basis for "medium", it is unclear if the limitation intended to be the same as the storage media disclosed or whether it is intended to be broader than the disclosed storage media.

Claim Rejections - 35 USC § 101

9. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

10. Claims 18-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 18 recites a "medium" and the specification fails to provide antecedent basis for this limitation. Without antecedent basis for the "medium", it is unclear if the limitation intended to be the same as the storage media disclosed or whether it is intended to be broader than the disclosed storage media. It is believed that the limitation "medium" is intended to claim something broader than the disclosed storage media and cover signals, waves and other forms of transmission media, which carry instruction. Therefore, the limitation "medium" is not limited to physical article or objects which constitute a manufacture within the meaning of 35 USC 101 and enable any functionality of the instruction carried thereby to act as a computer component and realize their functionality. As such, the claims are not limited to statutory subject matter and therefore are not statutory.

Claim Interpretations

11. Claims 2 & 25 recite "wherein steps (a) through (e) are performed prior to creating any fractures in the subterranean formation". This limitation is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure. Language that suggests or makes optional but does not require steps to be performed or does not limit a claim to a particular structure does not limit the scope of a claim or claim limitation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
12. Claims 1, 2, 4-6, 16-19, 21, 24, 25, 27 and 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5, 463, 164 issued to Perkins et al in view of Publication No. US 2004/0016541 A1 issued to Detournay et al.
- a. As per Claim 1, Perkins et al discloses a method of optimizing a number, placement and size of fractures in a subterranean formation (equation 1 used to calculate the height of the fractures which is equivalent to the spacing, equation 2 used to calculate the width of the fracture which is equivalent to the size of the fracture) comprising the steps of:
 - (c) determining one or more geomechanical stresses induced by each fracture based on the dimensions and location of each fracture (Col. 6 lines 10-12, fracture is governed by the stress distribution);

(d) determining a geomechanical maximum number of fractures based on the geomechanical stresses induced by each of the fractures (Equation 9 used to determine the maximum number of fractures);

(e) determining a predicted stress field based on the geomechanical stresses induced by each fracture (Col. 6 lines 10-12, fracture is governed by the stress distribution); and

(f) generating an optimized number, spacing and size for two or more fractures in subterranean (equation 1 used to calculate the height of the fractures which is equivalent to the spacing, equation 2 used to calculate the width of the fracture which is equivalent to the size of the fracture), where generating the optimized number, spacing and size for one or more fractures in a subterranean formation is based, at least in part, one or more of:

the geomechanical maximum number of fractures (Equation 9 used to determine the maximum number of fractures, which also include the height and the width of the fracture); and

the predicted stress field based on the geomechanical stresses induced by each fracture (Col. 6 lines 10-12, fracture is governed by the stress distribution , Equation 1 includes a stress induced).

Perkins et al does not expressly specify (a) selecting a method to model each fracture; (b) modeling each fracture in accordance with the selected method, so as to provide modeled dimensions and a location for each fracture.

Detournay et al discloses (a) selecting a method to model each fracture (See: paragraph [0024], radial hydraulic fractures/KGD fractures); (b) modeling each fracture in accordance with the selected method, so as to provide modeled dimensions and a location for each fracture (See: Figure 1, the modeling of fracture by finding the aperture w fracture and the fracture Radius $R(t)$).

It would have been obvious to one of ordinary skill in the art to combine the teaching of Detournay et al with the teaching of Perkins et al because both references are drawn to fracture formation. The motivation to include selecting a method such as radial hydraulic fractures and/or KGD fractures to model each fractures as taught by Detournay et al to the teaching of Perkins et al would be to predict and interactively control the dynamic behavior of hydraulic fracture propagation (See: paragraph [0005]) as taught by Detournay et al over Perkins et al.

- b. As per Claim 2, Perkins et al discloses the method according to claim 1, wherein steps (a) through (e) are performed prior to creating any of the fractures in the subterranean formation (intended use, no patentable weight, rejected similar to claim 1).
- c. As per Claim 4, Perkins et al discloses the method according to claim 1, further comprising the step of spacing the fractures a uniform distance from each other (See: Col. 6 lines 10-16, fractures which extends equally in two directions).
- d. As per Claim 5, Perkins et al discloses the method according to claim 1, further comprising the step of creating the fractures with a uniform size (See: Col. 6 lines 10-16, fractures which extends equally in two directions).

- e. As per Claim 6, Perkins et al discloses the method according to claim 1, further comprising the steps of: creating one or more fractures in the subterranean formation (See: Col. 2 lines 3-13, fracture volume is determined); and repeating steps (a) through (e) after each fracture is created (intended use, rejected as claim 1).
- f. As per Claim 16, Perkins et al discloses the method according to claim 1, wherein the subterranean formation comprises a well bore comprising a generally vertical portion (See: Fig. 1).
- g. As per Claim 17, Perkins et al discloses the method according to claim 16, wherein the well bore further comprises one or more laterals (See: Fig. 1, Lateral distance L).
- h. As per Claims 18, 19, 21, 24, 25, and 27, the instant claim(s) recite(s) substantially same limitation as the above rejected claim(s) 1, 2, and 6, and therefore rejected under the same rationale.
- i. As per claim 30, Perkins et al discloses the method of claim 1 wherein generating an optimized number, spacing and size for two more fractures in a subterranean formation comprises: generating an optimized number, placement and size for three or more fractures in the subterranean formation (equation 1 used to calculate the height of the fractures which is equivalent to the spacing, equation 2 used to calculate the width of the fracture which is equivalent to the size of the fracture).

- j. As per claim 31, the instant claim(s) recite(s) substantially same limitation as the above rejected claim(s) 30, and therefore rejected under the same rationale.
13. Claims 3, 20, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5, 463, 164 issued to Perkins et al as applied to claims above, and further in view of M. Y. Soliman, J. L. Hunt, and M. Azari, "Fracturing Horizontal Wells in Gas Reservoirs", SPE 1999.

k. As per Claim 3, Perkin et al fails to disclose determining a cost-effective number of fractures; determining an optimum number of fractures, where the optimum number of fractures is the maximum cost-effective number of fractures that does not exceed the geomechanical maximum number of fractures.

Soliman et al discloses the method according to claim 1, further comprising the steps of: determining a cost-effective number of fractures (such as "Benefit/cost ratio vs. number of fractures"; See: Fig. 14); determining an optimum number of fractures, where the optimum number of fractures is the maximum cost-effective number of fractures that does not exceed the geomechanical maximum number of fractures (such as "Benefit/cost ratio vs. number of fractures"; See: Fig. 14).

It would have been obvious to one of ordinary skill in the art to combine the teaching of Soliman et al with the teaching of Perkins et al because both references drawn to hydraulic fractures. The motivation to include a cost effective number of fractures of Soliman et al to the teaching of Perkins et al would be to

include the economic aspect with accurate estimation of well productivity for a given reservoir (Soliman et al).

l. As per Claim 20, and 26, the instant claim(s) recite(s) substantially same limitation as the above rejected claim(s) 3, and therefore rejected under the same rationale.

14. Claims 7-15, 22, 23, 28, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5, 463, 164 issued to Perkins et al as applied to claims above, and further in view of Publication No. US 2004/0206495 A1 issued to Lehman et al.

m. As per Claim 7, Perkins et al fails to disclose gathering and analyzing real-time fracturing data for each fracture.

Lehman et al discloses the steps of gathering and analyzing real-time fracturing data for each fracture (See: paragraph [0021], data from the fracturing process, including real-time data from the well and the aforementioned subsystem, is received and processed by the controller).

It would have been obvious to one of ordinary skill in the art to combine the teaching of Lehman et al with the teaching of Perkins et al because both references are drawn to fracture formation. The motivation to gathering and analyzing real-time fracturing data as taught by Lehman et al to the teaching of Perkins et al would be to apply sufficient pressure against the formation to break or separate the earthen material to initiate a fracture in the formation.

- n. As per Claim 8, Lehman et al discloses the method according to claim 7, wherein a well is placed in the subterranean formation, the well comprising a wellhead, a tubing, and a well bore, the well bore comprising a downhole section, and wherein the gathering of real-time fracturing data comprises the steps of: (i) measuring a fracturing pressure while creating a current fracture (See: paragraph [0021], data from the fracturing process, including real-time data from the well and the aforementioned subsystem, is received and processed by the controller); (ii) measuring a fracturing rate while creating the current fracture (See: paragraph [0021], data from the fracturing process, including real-time data from the well and the aforementioned subsystem, is received and processed by the controller); and (iii) measuring a fracturing time while creating the current fracture (See: paragraph [0021], data from the fracturing process, including real-time data from the well and the aforementioned subsystem, is received and processed by the controller) .
- o. As per Claim 9, Lehman et al discloses the method according to claim 8, wherein the measuring of fracturing pressure is accomplished using one or more transducers located at the wellhead (See: paragraph [0022], a pressure sensor, the bottom hole pressure can be measured).
- p. As per Claim 10, Lehman et al discloses the method of claim 8, wherein the measuring of fracturing pressure is accomplished using one or more transducers located down hole (See: paragraph [0026], the deformation pattern as measured by tiltmeters placed downhole).

q. As per Claim 11, Lehman et al discloses the method according to claim 8, wherein the fracturing pressure is measured in the tubing (See: paragraph [0022], a pressure sensor, the bottom hole pressure can be measured).

r. As per Claim 12, Perkins et al discloses determining a new stress field (See: Col. 5 lines 55-59, formation zones having in situ stresses which is greater than (i.e. comparing) the average stress in the prescribed zone); and comparing the new stress field with the predicted stress field (See: Col. 5 lines 55-59, formation zones having in situ stresses which is greater than (i.e. comparing) the average stress in the prescribed zone).

Perkins et al does not expressly disclose real-time fracturing data.

Lehman et al discloses real-time fracturing data (See: paragraph [0021], data from the fracturing process, including real-time data from the well and the aforementioned subsystem, is received and processed by the controller).

It would have been obvious to one of ordinary skill in the art to combine the teaching of Lehman et al with the teaching of Perkins et al because both references are drawn to fracture formation. The motivation to gathering and analyzing real-time fracturing data as taught by Lehman et al to the teaching of Perkins et al would be to apply sufficient pressure against the formation to break or separate the earthen material to initiate a fracture in the formation.

s. As per Claim 13, Lehman et al discloses the method according to claim 12, further comprising the step of decreasing the number of fractures in response to the real-time fracturing data (See: paragraph [0024], using such fracture

mapping in real time, the fracture propagation process can be altered to address risk mitigation).

t. As per Claim 14, Lehman et al discloses the method according to claim 12, further comprising the step of increasing the distance between the fractures in response to the real-time fracturing data (See: paragraph [0024], using such fracture mapping in real time, the fracture propagation process can be altered to address risk mitigation).

u. As per Claim 15, Lehman et al discloses the method according to claim 12, further comprising the step of adjusting the size of the fractures in response to the real-time fracturing data (See: paragraph [0024], using such fracture mapping in real time, the fracture propagation process can be altered to address risk mitigation).

v. As per Claims 22, 23, 28, and 29, the instant claim(s) recite(s) substantially same limitation as the above rejected claim(s) 7, and 12, and therefore rejected under the same rationale.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KIBROM GEBRESILASSIE whose telephone number is (571)272-8571. The examiner can normally be reached on Monday-Friday 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571)272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/KIBROM GEBRESILASSIE/
Examiner, Art Unit 2128

/David Silver/
Primary Examiner, Art Unit 2128